

## **Claims**

1. An electrical feed-through assembly to provide a hermetic seal in a coaxial connector, comprising:
  - a conductive insert having a bore;
  - a dielectric insert positioned within the bore having a first diameter sized such that an impedance of the dielectric insert is a target impedance;
  - a center conductive pin extending through the dielectric insert;
  - an air dielectric positioned within the bore having a second diameter sized such that an impedance of the air dielectric is the target impedance; and
  - a compensation gap positioned between the dielectric insert and the air dielectric, the compensation gap having an impedance larger than the target impedance;

wherein the compensation gap is a recess formed within the dielectric insert.
2. The electrical feed-through assembly of claim 1, wherein the dielectric insert comprises a glass bead.
3. The electrical feed-through assembly of claim 1, wherein the conductive insert comprises a conductive metal.

4. The electrical feed-through assembly of claim 3, wherein the conductive insert comprises Kovar.
5. The electrical feed-through assembly of claim 1, further comprising a sleeve positioned within the bore, wherein the dielectric insert is formed in the sleeve.
6. The electrical feed-through assembly of claim 5, wherein the sleeve is positioned within the bore by soldering.
7. The electrical feed-through assembly of claim 5, wherein the dielectric insert is formed by molding.
8. The electrical feed-through assembly of claim 1, wherein the dielectric insert is formed in the bore.
9. The electrical feed-through assembly of claim 8, wherein the dielectric insert is formed by molding.
10. An electrical feed-through assembly to provide a hermetic seal in a coaxial connector, comprising:  
a conductive insert having a bore and a cavity within the bore, the cavity surrounding a portion of the bore;

a dielectric insert positioned within the bore having a diameter sized such that an impedance of a portion of the dielectric insert is a target impedance, the dielectric insert extending into the cavity;

a center conductive pin extending through the dielectric insert;

an air dielectric positioned within the bore, the air dielectric having a diameter sized such that an impedance of a portion of the air dielectric is the target impedance; and

a compensation gap formed between the glass dielectric and the air dielectric, such that at least a portion of the compensation gap is surrounded by the cavity.

11. The electrical feed-through assembly of claim 10, wherein the dielectric insert comprises a glass bead.

12. The electrical feed-through assembly of claim 10, wherein the conductive insert comprises a conductive metal.

13. The electrical feed-through assembly of claim 10, wherein the conductive insert comprises Kovar.

14. The electrical feed-through assembly of claim 10, wherein the dielectric insert is formed within the bore.

15. The electrical feed-through assembly of claim 14, wherein the dielectric insert is formed by molding.

16. A dielectric insert assembly to provide a hermetic seal in a coaxial connector, comprising:

a substantially cylindrical sleeve having a first inner diameter; and

a dielectric insert formed within the sleeve, the dielectric insert having a proximal end and a distal end;

wherein the distal end includes a recess having a second diameter.

17. The dielectric insert assembly of claim 16, wherein the dielectric insert comprises a glass bead.

18. The dielectric insert assembly of claim 16, wherein the sleeve comprises a conductive metal.

19. The dielectric insert assembly of claim 16, wherein the dielectric insert is formed by molding.

20. A method of forming a dielectric insert assembly for insertion into an electrical feed-through assembly including a conductive insert having a bore to provide a hermetic seal in a coaxial connector, comprising:

positioning a sleeve so that the sleeve can be filled;

positioning a molded compensation step concentrically within the sleeve, the molded compensation step having a diameter smaller than an inner diameter of the sleeve;

positioning a center conductor pin within the molded compensation step so that the center conductor pin is approximately centered axially within the sleeve;

flowing a liquefied dielectric into the sleeve such that the liquefied dielectric substantially fills unoccupied space within the sleeve;

cooling the liquefied dielectric such that a dielectric insert is formed within the sleeve having the center conductor pin extending there-through; and

removing the molded compensation step from within the sleeve.

21. A method of forming an electrical feed-through assembly including a conductive insert having a bore having a first portion with a diameter sized such that an impedance of an air dielectric formed in the first portion is a target impedance and a second portion with a diameter sized such that an impedance of a glass dielectric formed in the second portion is the target impedance, the method comprising:

positioning a plug within the first portion of the bore;

positioning a center conductor pin within the plug so that when the plug is positioned within the bore, the center conductor pin is approximately centered axially within the bore;

flowing a liquefied dielectric into the conductive insert such that the liquefied dielectric fills the second portion of the bore not occupied by the plug;  
cooling the liquefied dielectric; and  
removing the plug from within the bore.

22. A method of forming an electrical feed-through assembly including a conductive insert having a bore having a first portion with a diameter sized such that an impedance of an air dielectric formed in the first portion is a target impedance and a second portion with a diameter sized such that an impedance of a glass dielectric formed in the second portion is the target impedance, the method comprising:

positioning a plug within the first portion of the bore such that the plug extends partially into the second portion of the bore;

positioning a center conductor pin within the plug so that when the plug is positioned within the bore, the center conductor pin is approximately centered axially within the bore;

flowing a liquefied dielectric into the conductive insert such that the liquefied dielectric fills the second portion of the bore not occupied by the plug;

cooling the liquefied dielectric; and

removing the plug from within the bore.

23. A method of forming an electrical feed-through assembly including a conductive insert having a bore having a first portion with a diameter sized such

that an impedance of an air dielectric formed in the first portion is a target impedance and a second portion with a diameter sized such that an impedance of a glass dielectric formed in the second portion is the target impedance, the bore further having a cavity extending from the first portion such that the cavity surrounds a portion of the second portion, the method comprising:

- positioning a plug within the first portion of the bore;
- positioning a center conductor pin within the plug so that when the plug is positioned within the bore, the center conductor pin is approximately centered axially within the bore;
- flowing a liquefied dielectric into the conductive insert such that the liquefied dielectric fills the second portion of the bore and the cavity;
- cooling the liquefied dielectric; and
- removing the plug from within the bore.